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CERAMIC MEMBER AND MANUFACTURING METHOD THEREOF

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[There are no amendments to this patent.]

Abstract

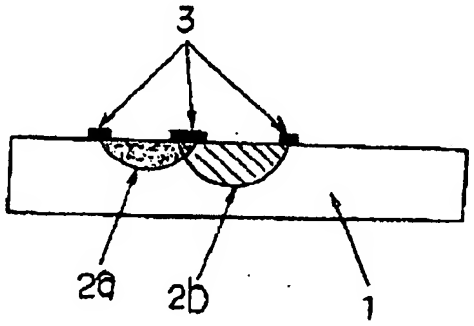
Problem

Blotting and color blending have occurred in the past at the boundary portion between a portion where a color is applied and a portion where no color is applied or between a portion

with a certain color applied and a portion with another color applied, so that the pattern becomes blurred.

Means to solve the problems

On a ceramic member prepared with color portions of different colors formed partially on it, in the contour portion of said color portions, a colored portion with a color different from that of the color portions is formed. Also, in a method for forming the ceramic member, color portions are formed with colors different from the remaining portion by coating coloring agents on the feed body of the ceramic member or an unglazed sintered member followed by sintering; and, after said color portions are formed, a coloring agent of a different color from those of said color portions is coated on the contour portion of the color portions, followed by heating.



Claims

1. A type of ceramic member characterized by the fact that for a ceramic member prepared by partially forming color portions of different colors, a colored portion of a color different from the color portions is formed in the contour portion of said color portions.

2. The ceramic member described in Claim 1 characterized by the fact that said ceramic member is a light-transmissive ceramic member.

3. The ceramic member described in Claim 1 or 2 characterized by the fact that said coloring portion is formed by means of a coating material or a color glazing agent.

4. The ceramic member described in Claim 1 or 2 characterized by the fact that said coloring portion is gold or silver.

5. The ceramic member described in Claim 1 or 2 characterized by the fact that said coloring portion is formed using a resin containing a pigment or filler.

6. A method for forming a ceramic member characterized by the fact that in the method for forming a ceramic member with color portions of different colors from the remaining portion by coating coloring agent solutions on the feed body of the ceramic member or an unglazed sintered member, after formation of said color portions, a coloring agent of a different color from

those of the color portions is coated in the contour portion of the color portions, followed by heating.

Detailed explanation of the invention

[0001]

Technical field of the invention

The present invention pertains to a type of ceramic member and its manufacturing method. Especially, the present invention pertains to a type of ceramic member that has color portions of different colors formed partially on it, and its manufacturing method.

[0002]

Prior art

Recently, with an increase in the freedom of design of porcelain art products and decorative products, new feed materials to expand this field are being pursued. One of the new feed materials proposed for said porcelain art products and decorative products is a ceramic member. Usually, a ceramic member has a high refractive index and high light reflectivity. Consequently, when its surface is polished and finished to a mirror surface quality, attractive porcelain art products and decorative products can be obtained. Although ceramic members usually are opaque, there are also light-transmissive ceramic members, such as those made of light-transmissive alumina. Also, the ceramic member may contain metal oxides and be sintered such that the material itself emits light to realize coloring. A light-transmissive alumina member scatters almost all of the light rays inside it before the light rays pass through it. Consequently, light emitted from a ceramic member is diffused, so that the ceramic member appears bright and attractive. Also, porcelain art products and decorative products prepared using ceramic members have high strength and high hardness characteristic of ceramics, so that they have high resistance against impact and scratching. Consequently, the attractive appearance when the product is manufactured (initial attractive appearance) can be maintained for a long time. As a result, the value increases.

[0003]

When metal oxides are mixed into the feed material of a ceramic member, followed by sintering, the ceramic material itself can emit colorful light. In order to paint a ceramic member with plural colors, solutions of coloring agents made of various metal salts as oxides are used to paint the porous feed body of the ceramic member or an unglazed sintered member by means of brushes or the like to form a desired pattern. Then, the painted feed body of the ceramic member

or the unglazed sintered member is sintered so that the ceramic material itself emits colorful light to form a color pattern.

[0004]

Problems to be solved by the invention

When a coloring agent solution is coated on a porous feed body of a ceramic member or an unglazed sintered member, the coloring agent solution penetrates and diffuses into the porous feed material, blotting takes place between the portion where a color is applied and the portion where no color is applied, or the coloring agent solutions mix in the boundary portion between the portion with a certain color applied and the portion with another color applied. When the coloring agent solutions blot or mix while the feed body of a ceramic member or an unglazed sintered member is sintered to form the ceramic member, the intrinsic attractive appearance degrades, and this is undesirable.

[0005]

Especially, when the ceramic member is formed from a light-transmissive ceramic material, said blotting and color mixing significantly degrade the appearance.

[0006]

Objective of the present invention

The objective of the present invention is to solve the aforementioned problems of the prior art by providing a type of ceramic member characterized by the fact that it can eliminate the problem of blotting or color mixing at the boundary portion between the portion where a color is applied and the portion where no color is applied or between the portion with a certain color applied and the portion with another color applied.

[0007]

Problems to be solved by the invention

In order to realize the aforementioned objective, the present invention provides a type of ceramic member characterized by the fact that for the ceramic member prepared by partially forming color portions of different colors, a colored portion with a color different from the color portions is formed in the contour portion of said color portions.

[0008]

Also, the present invention provides a method for forming a ceramic member characterized by the fact that in the method for forming a ceramic member with color portions of

colors different from the remaining portion by coating coloring agent solutions on the feed body of the ceramic member or an unglazed sintered member, after formation of said color portions, a coloring agent of a different color from those of the color portions is coated in the contour portion of the color portions, followed by heating.

[0009]

Embodiment

In the following, an explanation will be given in detail regarding embodiment of the present invention with reference to figures. Figure 1 is a cross-sectional view illustrating an embodiment of the ceramic member of the present invention. (1) represents the ceramic member; (2a), (2b) represent color portions; and (3) represents a coloring portion.

[0010]

For example, said ceramic member (1) is made of an alumina ceramic, light-transmissive ceramic, mullite ceramic, hard china, etc. It may have any of various forms, such as a plate, rod, ball, semi-ball, mortar, cylinder, bottomed cylinder, etc.

[0011]

On said ceramic member (1), color portions (2a), (2b) of colors different from those of the remaining portion are formed. Said color portions (2a), (2b) contain coloring agents made of metal oxides, etc., and they have different colors from those of ceramic member (1) itself.

[0012]

Coloring portion (3) is formed on the contour portion of said color portions (2a), (2b). Said coloring portion (3) is opaque or has a dense hue. It is formed to cover the border region between color portions (2a), (2b) and portions adjacent to said color portions (2a), (2b).

[0013]

When ceramic member (1) is made of an alumina ceramic, the operation is performed as follows: 0.5-1 part of a dispersant, 2-5 parts of a binder, and 25-30 parts water are added to 100 parts alumina powder. After the mixture is blended in a ball mill, vacuum defoaming is performed, and, e.g., a cast molding method is adopted to form a feed molding. Then, the feed molding is dried and it is heated slowly to about 500°C to remove the binder, followed by sintering at a relatively low temperature of 950°C. As shown in Figure 2, sintered feed member (1a) of the ceramic member is formed.

[0014]

On the other hand, for example, when ceramic member (1) is made of a light-transmissive alumina ceramic, the operation is performed as follows: 0.5-2 parts of a dispersant, 2-5 parts of a binder, and 25-30 parts water are added into 100 parts of a high-purity alumina powder with 300-500 ppm magnesia doped in it. After the mixture is blended in a ball mill, vacuum defoaming is performed, and, e.g., a cast molding method is adopted to form a feed molding. Then, the feed molding is dried and heated slowly to about 500°C to remove the binder, followed by sintering at a relatively low temperature of 900°C. As shown in Figure 2, sintered feed member (1a) of the ceramic member is formed.

[0015]

When ceramic member (1) is made of mullite ceramic, the operation is performed as follows: 3-5 parts paraffin as a binder are added into 100 parts of a synthetic mullite powder feed material prepared by sintering a mixture of a fine powder of alumina and kaolin in an appropriate ratio followed by pulverization. While the mixture is agitated, it is heated. Then, the wax is mixed uniformly in the mullite powder, followed by granulation. The obtained grains are put into dies, followed by pressing and molding. As a result, a feed molding is formed. Then, the feed molding is dried and heated slowly to about 500°C to remove the binder, followed by sintering at a relatively low temperature of 850°C. As shown in Figure 2, sintered feed member (1a) of the ceramic member is formed.

[0016]

In addition, when ceramic member (1) is made of hard china, the operation is performed as follows: 50 parts of a kaolin, 25 parts of a feldspar, 25 parts of a quartz, 50 parts water and a small quantity of water glass as a deflocculating agent are mixed, and the mixture is pulverized and blended by a ball mill to form a paste. Then, dewatering is performed to a water content of about 20 wt%, followed by defoaming with a vacuum kneader, so that the blend is well-blended to form a cylindrical lump. The lump is used to form a feed mold. The mold is well-dried naturally, and is sintered at a relatively low temperature of 850°C. As a result, as shown in Figure 2, sintered feed member (1a) is formed.

[0017]

Then, as shown in Figure 3, by partially coating coloring agent solutions onto said sintered feed member (1a), patterns (2a'), (2b') are formed. The coloring agent solutions used in the present invention are composed of a metal salt as a coloring agent and a solvent. The metal

salt for dissolving in the solvent is of any type that can become a colored oxide for the ceramic member. For example, one may use the following: chromium nitrate 9-hydrate ($Cr(NO_3)_2 \cdot 9H_2O$), cobalt nitrate 6-hydrate ($Co(NO_3)_2 \cdot 6H_2O$), nickel nitrate 6-hydrate ($Ni(NO_3)_2 \cdot 6H_2O$), manganese nitrate hydrate ($Mn(NO_3)_2 \cdot nH_2O$), as well as their mixtures. Usually, pure water is used as the solvent.

[0018]

When a coloring agent made of a said metal salt is sintered together with an alumina ceramic sintered feed member, chromium nitrate forms a pink ~ red ~ vermillion color; cobalt nitrate forms a light blue ~ prussian blue color. When nickel nitrate is sintered in a vacuum furnace, it forms a gray ~ sky blue color, and, when it is sintered again in a gas furnace or electric furnace, it forms a yellowish green ~ dark green color. When manganese nitrate is sintered in a vacuum furnace, it forms a pink color, and, when it is re-sintered in a gas furnace or electric furnace, it forms an orange color.

[0019]

When a coloring agent made of said metal salt is sintered together with the feed body of a ceramic member of a mullite ceramic in a gas furnace or electric furnace, chromium nitrate forms a grayish green color, cobalt nitrate forms a blue color, nickel nitrate forms a grayish brown color, and manganese nitrate forms a violet brown color.

[0020]

In addition, when a coloring agent made of said metal salt is sintered together with the feed body of a ceramic member made of a hard ceramic in a gas furnace or electric furnace, chromium nitrate forms a gray ~ grayish black color, cobalt nitrate forms a blue color; nickel nitrate forms a grayish green color, and manganese nitrate forms a grayish brown color.

[0021]

When coloring agent solutions are coated by a brush or sprayer onto the feed member of sintered feed member (1a) of a ceramic member to depict patterns, the coloring agent solutions of two or more colors are sequentially coated to form multicolor patterns and drawings.

[0022]

Then, after said processing sintered feed member (1a) is baked at 1000°C in an electric furnace, so that combustible substances contained in the coloring agent solution penetrating the feed material are burned off, and, at the same time, the penetrating metal salt is oxidized.

[0023]

Then, the member is sintered at a high temperature. Usually, an alumina ceramic is sintered in a gas furnace in an atmosphere at a temperature of 1600°C or higher. A light-transmissive alumina ceramic is sintered in a vacuum furnace to realize the desired light-transmissive appearance. In order to obtain the desired hue, the member is re-sintered in a gas furnace or electric furnace to adjust the hue. Also, a mullite ceramic is sintered in a gas furnace at a temperature of 1500°C or higher. Also, hard china is sintered in a gas furnace or electric furnace at 1340°C. However, in order to realize a light-transmissive property, it may also be sintered at 1400°C or higher.

[0024]

A sintered and colored ceramic member prepared as above is polished manually or by means of barrel polishing to realize an attractive appearance and a good sensation.

[0025]

Finally, coloring layer (3) is formed on the contour portion of color portions (2a), (2b) of ceramic member (1) as shown in Figure 1.

[0026]

Said coloring layer (3) is formed by means of a coating material or a color glazing agent. In this case, a commercially available coating material or a color glazing agent is adjusted to an appropriate viscosity by means of an oil that can dissolve it, and the solution is painted using a brush. After drying, sintering is performed in an electric furnace to fuse it onto the member. Said coating material usually fuses at 750~800°C, and a white glazing agent fuses at 700~800°C. By adjusting the fusing temperature, it is possible to form coloring layer (3) either with or without gloss.

[0027]

The contour of coloring layer (3) is formed using a metal, such as gold or silver coloring material. A commercially available gold solution or silver solution or liquid platinum for painting on porcelain art products is adjusted by an oil solvent for painting. After drying, it is sintered and fixed in an electric furnace at 700~800°C, forming coloring layer (3).

[0028]

When coloring layer (3) is formed using a resin containing a pigment or filler, a lacquer or cashew resin paint or another paint with high durability is adjusted using turpentine or another solvent, and the solution is painted with a brush. The paint is dried and fixed to form color layer (3).

[0029]

Application examples

Application Example 1

5 parts paraffin wax as a binder were added to 100 parts fine alumina feed material with a purity of 99%. While heated, the mixture was agitated to form a homogeneous mixture. After granulation, the mixture was put into dies, and was pressed and molded to form a plate-shaped molding. Then, this was sintered at 950°C to form an alumina sintered feed member as sintered feed member (1a). Then, a brush was used to paint a pattern on the member using 100 mL of a transparent coloring agent solution with a light green color prepared by dissolving 15 g nickel nitrate 6-hydrate ($Ni(NO_3)_2 \cdot 6H_2O$) in pure water. After air-drying for 24 h, it was baked in an electric furnace at 1100°C, followed by sintering in a gas furnace at 1650°C to form an alumina ceramic member with a green pattern floating on a light green background. This was polished by a planar grinder using a diamond-grain grindstone to finish to a glossy state. As a result, an attractive green pattern is present on a green background, and the feel to the hand is also good. Then, a dark-green color glaze was used to depict the contour on the periphery of the green pattern of the member. After drying, it was sintered in an electric furnace at 750°C to fuse it. As a result, a contour was formed by coloring layer (3). As a result, the border on the periphery of the colored portion on the member was augmented to highlight the hue. As a result, a ceramic tile for pavement decoration with a modulated intonation of a green pattern was obtained.

[0030]

Application Example 2

7 parts paraffin wax as a binder were added to 100 parts synthetic mullite feed material. While heated, the mixture was agitated to form a homogeneous mixture. After granulation, the mixture was put into dies, and was pressed and molded to form a plate-shaped molding. Then, this was sintered at 900°C to form a mullite sintered feed member as sintered feed member (1a). Then, a brush was used to paint a pattern on the member using 100 mL of a transparent coloring agent solution, which was prepared by dissolving 50 g of manganese nitrate hydrate ($Mn(NO_3)_2 \cdot nH_2O$) in 50 mL ethyl alcohol, followed by adding 50 mL turpentine to dissolve this

while warming. After air-drying for 24 h, this was baked in an electric furnace at 1100°C, followed by sintering in a gas furnace at 1500°C, to form a mullite ceramic member with a violet brown pattern on a white background. This was polished by a barrel grinder to finish to a smooth surface. As a result, an attractive violet brown pattern is present on a white background, and the feel to the hand is also good. Then, a black cashew paint was used to depict the contour on the periphery of the pattern on the member. After drying in a dryer at 40°C for 12 h, it was coated again by superimposing, followed by drying. Then, it was coated again by superimposing followed by drying at 80°C for 12 h to form a contour by the coloring portion that adheres with high strength. Then, the surface of the paint was polished with sandpaper #1200 for carpentry, forming a contour by the coloring portion with a good feel to the hand. As a result, a ceramic tile for furniture decoration with a vivid violet brown pattern having a black edge on a white background was obtained.

[0031]

Application Example 3

0.05 part magnesia was added to 100 parts high purity alumina (99.99%, grain size of 0.5 μm). Then, 1 part dispersant and 25-30 parts pure water were added, and the mixture was dispersed and blended by a ball mill for 16 h. Then, 5 parts acrylic binder and 0.2 part of a defoaming agent were added, followed by dispersion and blending in the mill for 1 h. Then, after passing through 300-mesh sieve, vacuum foaming was performed to obtain an alumina slurry. The slurry was allowed to flow into a gypsum mold in semi-spherical bowl shape, and a 3-mm-thick molding was obtained using the sludge-exhausting cast-in method. After it was dried, it was slowly heated and was sintered at a relatively low temperature of 900°C. As a result, a bowl-shaped feed body of a ceramic member was obtained. Then, using the same scheme as that adopted in Application Examples 1 and 2, a pattern was depicted on it using 100 mL of a dark-violet-colored transparent coloring agent solution prepared by dissolving 20 g cobalt nitrate 6-hydrate ($Co(NO_3)_2 \cdot 6H_2O$) in pure water to form a transparent light pink coloring agent solution, and 100 mL of a solution prepared by dissolving 30 g chromium nitrate 9-hydrate ($Cr(NO_3)_2 \cdot 9H_2O$) in pure water. After air-drying for 24 h, it was baked at 1100°C in an electric furnace. In order to realize a light-transmissive appearance, it was sintered in a vacuum furnace at 1700°C. In order to obtain a good hue, it was again sintered in a gas furnace at 1600°C for oxidation. As a result, a light-transmissive ceramic member with a blue/red pattern floating on an ivory color background with a light-transmissive appearance was obtained. It was polished by diamond grinding grains manually to get a good gloss and good feel to the hand. Then, on the periphery of the pattern on the light-transmissive ceramic member, a contour was painted using a green coating material for porcelain art products. After drying, it was sintered in an electric

furnace at 800°C for fusing. As a result, a border of the color portion was formed. As a result, on the periphery of the colored portion of the member, a vivid green colored edge is applied to the boundary portion of a different hue, and, within the edge of this boundary portion, a blue and red pattern vividly floats on the light-transmissive ceramic member as a lamp shade.

[0032]

Application Example 4

Ceramic member (1) was made of a light-transmissive alumina ceramic in the same way as in Application Example 3. In this case, just as in Application Example 3, an alumina slurry was obtained. Then, using the sludge-exhausting cast-in method, a 1.5-mm-thick molding was obtained. After it was dried, it was sintered at 900°C to obtain a small bowl-shaped feed body of the ceramic member. Then, using the same scheme as in Application Examples 1, 2 and 3, a pattern was depicted on it using 100 mL of a transparent light pink coloring agent solution prepared by dissolving 20 g of manganese nitrate 6-hydrate ($Mn(NO_3)_2 \cdot 6H_2O$) in pure water. After natural drying for 24 h, it was baked at 1100°C in an electric furnace. It was then sintered in a vacuum furnace at 1700°C, and it was again sintered in a gas furnace at 1600°C for oxidation. As a result, a light-transmissive ceramic member as a wine cup with a red brown pattern floating on an ivory color background with a light-transmissive appearance was obtained. It was polished by barrel polishing to get a good gloss and a good feel to the hand. Then, on the periphery of the pattern on the light-transmissive ceramic member, a contour was painted using a gold liquid for porcelain art products. After drying, it was sintered in an electric furnace at 800°C for fixing, and a contour of the color portion was formed by a gold-color coloring agent. As a result, the periphery of the colored portion of the member has no blotting of color, and a vivid reddish brown pattern floats on the ivory-colored background of the light-transmissive ceramic member as a wine cup for drinking cold wine.

[0033]

Effect of the invention

As explained above, for the ceramic member of the present invention, in the contour portion of color portions with colors different from the remaining portion, a color portion of a color different from those of the color portions is applied. As a result, there is no blotting in the contour portion of the color portions, and, in the boundary portion between color portions, color mixing can be shielded by the coloring portion. As a result, on the surface of the ceramic member, it is possible to depict a modulated intonation as the pattern. Consequently, it is possible to further increase the value of porcelain art products and decorative products.

[0034]

Also, in the manufacturing method of the ceramic member of the present invention, by coating coloring agent solutions on the feed body of the ceramic member or an unglazed sintered member, color portions with colors different from that of the remaining portion are formed. Then, in the contour portion of the color portions, a coloring portion of a color different from that of the color portions is formed. As a result, no blotting or color mixing takes place in the contour portion of the color portions, and it is easy to form color portions that are clearly distinguished from the remaining portion.

Brief description of the figures

Figure 1 is a diagram illustrating an application example of the ceramic member of the present invention.

Figure 2 is a diagram illustrating a step of operation in the manufacturing method of the ceramic member of the present invention.

Figure 3 is a diagram illustrating another step of operation of the manufacturing method of the ceramic member of the present invention.

Explanation of reference symbols

1	Ceramic member
1a	Feed body of the ceramic member
2a, 2b	Color portion
3	Coloring portion

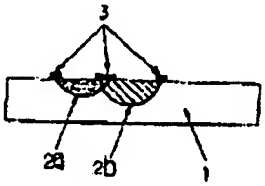


Figure 1

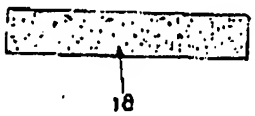


Figure 2

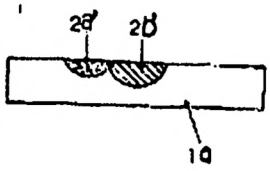


Figure 3

2)

EXHIBIT F

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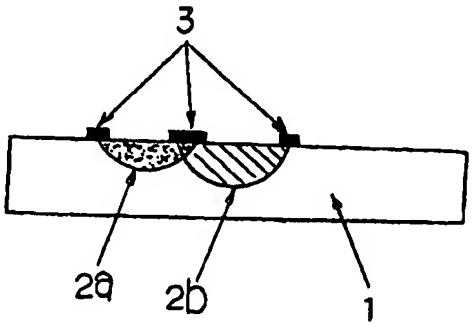
(54)【発明の名称】　セラミック部材とその製造方法

(57)【要約】
【課題】　セラミック部材の彩色を施す部分とそうでない部分、あるいは彩色を施す部分と他の彩色を施す部分の境界部に、にじみや混色が発生して不鮮明になる。
【課題解決手段】　部分的に異なる色彩を呈する彩色部を設けて成るセラミック部材において、前記彩色部の輪郭部にこの彩色部とは異なる色彩を呈する着色部を設けた。また、セラミック部材の生成形体もしくは素焼き品に着色剤を塗布して焼成することにより他の部分とは異なる色彩を呈する彩色部を形成するセラミック部材の形成方法において、前記彩色部を形成した後、この彩色部の輪郭部に、この彩色部とは異なる色彩を呈する着色剤を塗布して加熱して形成する。



【特許請求の範囲】
【請求項１】　部分的に異なる色彩を呈する彩色部を設けて成るセラミック部材において、前記彩色部の輪郭部に、この彩色部とは異なる色彩を呈する着色部を設けたことを特徴とするセラミック部材．
【請求項２】　前記セラミック部材が透光性セラミック部材であることを特徴とする請求項１に記載のセラミック部材．
【請求項３】　前記着色部が上絵の具もしくは色釉薬で形成されていることを特徴とする請求項１又は請求項２に記載のセラミック部材．
【請求項４】　前記着色部が金彩もしくは銀彩で形成されていることを特徴とする請求項１又は請求項２に記載のセラミック部材．
【請求項５】　前記着色部が顔料もしくは充填剤を含む樹脂で形成されていることを特徴とする請求項１又は請求項２に記載のセラミック部材．
【請求項６】　セラミック部材の生成形体もしくは素焼き品に着色剤溶液を塗布して焼成することにより他の部分とは異なる色彩を呈する彩色部を形成するセラミック部材の形成方法において、前記彩色部を形成した後、この彩色部の輪郭部に、この彩色部とは異なる色彩を呈する着色剤を塗布して加熱することを特徴とするセラミック部材の形成方法．
【発明の詳細な説明】
【０００１】
【発明の属する技術分野】本発明はセラミック部材とその製造方法に関し、特に部分的に異なる色彩を呈する彩色部を有するセラミック部材とその製造方法に関する．
【０００２】
【従来の技術】近時、陶芸品、工芸品あるいは装飾品においてはデザインの自由度を高めると共に、これらの分野を拡大するために新素材を積極的に用いることが試みられている．その一つとしてセラミック部材で陶芸品、工芸品あるいは装飾品を形成することが提案されている．セラミック部材は一般に屈折率の高いものが多く、光の反射率も高いので、表面を研磨して鏡面光沢に仕上げると美しい陶芸品、工芸品あるいは装飾品となる．セラミック部材は通常不透明であるが透光性アルミナのように透光性でしかも金属の酸化物を含ませて焼成して材質自体を発色させて着色できるセラミックもある．透光性アルミナ部材は内部で光線をほどよく散乱させて透過するので、セラミック部材から放出される光は拡散して柔らかく輝き、美しい．また、セラミック部材による陶芸品、工芸品あるいは装飾品はセラミック本来の特色である高い強度と硬度を持ち、打ち傷や擦り傷にも強いという性質がある．従って、製作した当初の美しさ（初期美観）を長期にわたって保ち続けるので価値も高い．
【０００３】セラミック部材の原料に金属の酸化物を混合して焼成すればセラミックの材質自体を発色させることができる．そこでセラミック部材を複数の色で彩色するのに、多孔質なセラミック部材の生成形体又は素焼き品の素地に、焼成によって酸化物となる各種の金属塩を溶解した着色剤溶液を筆などで塗布して浸透させて模様などを描写して、セラミック部材の生成形体又は素焼き品を焼成することにより、セラミック自体を発色させて色彩による模様などを形成している．
【０００４】
【発明が解決しようとする問題点】このように多孔質なセラミックの生成形体又は素焼き品の素地に、着色剤溶液を塗布して描写すると、多孔質な素地に着色剤溶液が浸透して拡散するので、彩色を施す部分と彩色を施さない部分の境界部ににじみが発生したり、彩色を施す部分と他の彩色を施す部分の境界部で着色剤溶液が混合する．このように着色剤溶液がにじんだり、混合した状態でセラミック部材の生成形体や素焼き品を焼成するとセラミック部材は、本来の美観を損なうという問題があった．
【０００５】特に、セラミック部材を透光性のセラミック部材で形成する場合は、このにじみや混色によって美観が大きく損なわれる．
【０００６】
【発明の目的】本発明は、このような従来技術の欠点に鑑みて発明されたものであり、セラミック部材の彩色を施す部分とそうでない部分あるいは彩色を施す部分と他の彩色を施す部分の境界部ににじみや混色が発生して不鮮明になることを解消することを目的とする．
【０００７】
【問題を解決するための手段】上記目的を達成するために、本発明に係わるセラミック部材では、部分的に異なる色彩を呈する彩色部を設けて成るセラミック部材において、前記彩色部の輪郭部にこの彩色部とは異なる色彩を呈する着色部を設けたことを特徴とする．
【０００８】また、本発明に係るセラミック部材の製造方法によれば、セラミック部材の生成形体もしくは素焼き品に着色剤を塗布して焼成することにより他の部分とは異なる色彩を呈する彩色部を形成するセラミック部材の形成方法において、前記彩色部を形成した後、この彩色部の輪郭部に、この彩色部とは異なる色彩を呈する着色剤を塗布して加熱することを特徴とする．
【０００９】
【実施の形態】以下、本発明の実施形態を添付図面に基づき詳細に説明する．図１は、本発明に係るセラミック部材の一実施形態を示す断面図であり、１はセラミック部材、２ａ、２ｂは彩色部、３は着色部である．
【００１０】セラミック部材１は、例えばアルミナセラミック、透光性アルミナセラミック、ムライトセラミック、あるいは硬質磁器などからなり、板状、柱状、球状、半球状、すり鉢状、筒状、有底筒状など種々の形態に形成される．

【００１１】セラミック部材１には、他の部分と異なる色彩を呈する彩色部２ａ、２ｂが形成されている。この彩色部２ａ、２ｂは、金属酸化物などからなる着色剤を含有しており、セラミック部材１自体が異なった色彩に発色する。

【００１２】彩色部２ａ、２ｂの輪郭部には、着色部３が設けられている。着色部３は不透明もしくは濃厚な色調を持ち、彩色部２ａ、２ｂと他の領域、あるいは彩色部２ａ、２ｂが接する部分を覆うように設けられている。

【００１３】セラミック部材１をアルミナセラミックで構成する場合、アルミナ粉末１００部に、分散剤０．５～１部、バインダー２～５部、水２５～３０部を加え、ボールミルで混合した後、真空脱泡し、例えば鋳込み成形法などで生成形品を形成する。次に、この生成形品を乾燥後、脱バインダーのために５００℃付近までゆっくりと昇温し、９５０℃という低温で焼成することにより、図２に示すように、アルミナセラミックの素焼き品１ａを形成する。

【００１４】また、アルミナセラミック部材１を例えば透光性のアルミナセラミックで構成する場合、高純度微粉アルミナに３００～５００ＰＰＭのマグネシアを添加した原料１００部に、分散剤０．５～２部、バインダー２～５部、水２５～３０部を加え、ボールミルで混合した後、真空脱泡し、例えば鋳込み成形法などで生成形品を形成する。次に、この生成形品を乾燥後、脱バインダーのために５００℃付近までゆっくりと昇温し、９００℃という比較的低温で焼成することにより、図２に示すように、セラミックの素焼き品１ａを形成する。

【００１５】また、セラミック部材１を例えばムライトセラミックで構成する場合、微粉アルミナとカオリンを所定の比率で調合し焼成し粉砕してなる合成ムライト粉末原料１００部に、バインダーとしてパラフィンワックス３～５部を加え、撹拌しながら加熱してムライト粉末にワックスをむらなく混合した後に造粒し、金型に充填して加圧して成形することにより、生成形品を形成する。次に、この生成形品を脱バインダーのために５００℃付近まで時間をかけて徐々に昇温し、８５０℃という低温で焼成することにより、図２に示すようにセラミックの素焼き品１ａを形成する。

【００１６】さらに、セラミック部材１を硬質磁器で構成する場合、カオリン５０部、長石２５部、石英２５部、水５０部、及び解膠剤として少量の水ガラスを調合し、ボールミルで粉砕混合して泥漿にし、これをフィルタープレスで水分２０重量％程度に脱水し、さらに真空土練機で脱泡しながら良く練って円柱状の坏土に形成する。この坏土を用いてろくろ等によって生成形品を形成する。次に、この成形品を充分に自然乾燥をして８５０℃という低温で焼成することにより、図２に示すように、素焼き品１ａを形成する。

【００１７】次に、図３に示すように、セラミックの素焼き品１ａに、着色剤溶液を部分的に塗布することにより、模様２ａ'、２ｂ'を形成する。本発明で用いる着色剤溶液は、金属塩よりなる着色剤、及び溶剤で構成される。金属塩としては溶剤に溶け、焼成によって酸化物となりセラミックを発色させるものが用いられる。例えば硝酸クロム９水和物（$Cr(NO_3)_2 \cdot 9H_2O$）、硝酸コバルト６水和物（$Co(NO_3)_2 \cdot 6H_2O$）、硝酸ニッケル６水和物（$Ni(NO_3)_2 \cdot 6H_2O$）、硝酸マンガン水和物（$Mn(NO_3)_2 \cdot nH_2O$）、またはそれらの混合物などが用いられる。通常これらの溶剤には純水を用いる。

【００１８】これらの金属塩からなる着色剤がアルミナセラミックの素焼き品などとともに焼成されると、硝酸クロムはピンク～赤～深紅に発色し、硝酸コバルトは淡青～濃紺に発色する。また硝酸ニッケルは真空炉焼成した場合は灰～空色に発色し、これをガス炉や電気炉で再焼成すると黄緑～暗緑に発色する。硝酸マンガンは真空炉で焼成した場合はピンクに発色し、これをガス炉や電気炉で再焼成するとオレンジ色に発色する。

【００１９】また、これらの金属塩からなる着色剤がムライトセラミックの素焼き品などとともにガス炉や電気炉で焼成されると、硝酸クロムは灰緑に、硝酸コバルトは青に、硝酸ニケッルは灰茶に、硝酸マンガンは紫褐色に発色する。

【００２０】さらにこれらの金属塩からなる着色剤が硬質磁器の素焼き品などとともにガス炉や電気炉で焼成されると、硝酸クロムは灰～灰黒に、硝酸コバルトは青に、硝酸ニッケルは灰緑に、硝酸マンガンは灰褐色に発色する。

【００２１】着色剤溶液をセラミック部材の素焼き品１ａの素地に塗布するには、筆やスプレーを用いて模様などを描写していく。このような方法で二色以上の着色剤溶液を順次塗布して多色の模様や絵柄を形成することができる。

【００２２】次に、このような加工を施したセラミックの素焼き品１ａを電気炉を用いて１０００℃で仮焼して、素地の中に浸透している着色剤溶液中の可燃物を焼成揮散させるとともに浸透している金属塩を酸化させる。

【００２３】次いで、高温で焼成して焼結させる。通常、アルミナセラミックはガス炉を用いて大気中で１６００℃以上の高温で焼成して焼結させる。透光性アルミナセラミックは透光感を得るために真空炉で焼結させる。好ましい色調を得るためにガス炉や電気炉で再焼成して色調を整えることもある。また、ムライトセラミックはガス炉を用いて１５００℃以上の温度で焼結させる。また、硬質磁器はガス炉や電気炉を用いて１３４０℃で焼結するが、透光性を持たせるために１４００℃以上の温度で焼成することもある。

【0024】このようにして焼結させて発色させたセラミック部材を手研磨またはバレル研磨することによって、美しさと手触りのよさを整える。

【0025】最後に、図1に示すようにセラミック部材1の彩色部2a、2bの輪郭部に着色層3を形成する。

【0026】着色層3を上絵具もしくは色釉薬によって形成するには、市販の上絵具や色釉薬を溶き油で練って粘度を調整して筆塗りし、乾燥させた後に、電気炉で焼成して融着させる。上絵具は通常750～800℃で融着し、白釉薬は700～800℃で融着する。融着温度を加減して艶消しないし光沢のある着色層3を自在に形成できる。

【0027】着色層3による輪郭を金彩や銀彩などの金属によって形成するには、市販の陶芸用の金液、銀液あるいはプラチナ液を溶き油で調整して筆塗りし、乾燥させた後に、電気炉を用いて700～800℃で焼成して固着させることにより着色層3を形成する。

【0028】着色層3による輪郭を顔料もしくは充填剤（フィラー）を含む樹脂によって形成するには、漆やカシュウなどの耐久性のある塗料をテレピン油などの溶剤で調整して筆塗りし、これを乾燥させて固着させることにより着色層3を形成する。

【0029】

【実施例】

－実施例1－

純度99%のアルミナ微粉原料100部にバインダーとしてパラフィンワックス5部を加え、加熱しながら撹拌してむらなく混合し、造粒したのちに金型に充填して加圧成形して板状の成形品を形成した。次に、950℃で素焼き品を焼成してアルミナの素焼き品1aを得た。これに、硝酸ニッケル6水和物（$Ni(NO_3)_2 \cdot 6H_2O$）15gを純水に溶解し、全体を100mlにした淡い緑を呈する透明な着色剤溶液を筆に含ませて模様を描写した。自然乾燥を一昼夜行い、電気炉で1100℃で仮焼し、ガス炉を用いて1650℃で焼成して焼結させ、淡いクリーム色の素地に緑の模様が浮かび上がったアルミナセラミック部材を得た。これをダイヤモンド砥粒を用いた砥石で平面研削盤によって研磨し光沢に仕上げた。これによってクリーム色の素地上の緑色模様は美しくなり、また手触りも良くできた。次に、この部材の緑色模様の周囲に濃緑色の色釉を用いて輪郭を描き、乾燥後、電気炉を用いて750℃で焼成して、融着させ、着色層3による輪郭を形成した。これにより部材の着色した部分の周囲に境界が加わって色調が強調され、メリハリのある緑色模様をもった路面装飾用セラミックタイルを得た。

【0030】－実施例2－

合成ムライト原料100部にバインダーとしてパラフィンワックス7部を加え、加熱しながら撹拌してむらなく混合し、造粒したのち金型に充填して加圧成形して板状の成形品を形成した。次に、900℃で素焼き焼成してムライトの素焼き品1aを得た。これに、硝酸マンガン水和物（$Mn(NO_3)_2 \cdot nH_2O$）50gをエチルアルコール50mlに溶解し、それにテレピン油50mlを加えて温めながら溶かし、全体を100mlにした透明な着色剤溶液を、筆に含ませて模様を描写した。自然乾燥を一昼夜行い、電気炉を用いて1100℃で仮焼し、ガス炉を用いて1500℃で焼結させ、白地に紫褐色の模様が浮かび上がったムライト質のセラミック部材を得た。バレル研磨機を用いてこの表面を平滑な面に仕上げ、白地に紫褐色の模様は美しくなり、手触りもよくすることができた。次に、このセラミック部材の模様の周囲に黒色のカシュー塗料を用いて筆で輪郭を描き、乾燥機を用いて40℃で12時間乾燥後、さらに重ね塗りをして同様に乾燥後、再び重ね塗りをして80℃で12時間乾燥して強固に固着させて着色層による輪郭を形成したこの後、木工用サンドペーパー1200番で塗料表面を研ぎ出して手触りのよい着色層による輪郭を形成した。これにより白地に黒く縁取りされた紫褐色の模様が鮮明に浮かび上がった家具用装飾セラミックタイルを得た。

【0031】－実施例3－

高純度アルミナ（99.99%、粒径0.5μm）100部にマグネシア0.05部を添加し、分散剤1部、純水25～30部を加え、ボールミルで16時間分散混合した後、アクリル系のバインダー5部と消泡剤0.2部を加えさらに1時間ミルで分散混合した後、300メッシュの篩を通してから真空脱泡し、アルミナスラリーを得た。これを半円の椀状の石膏型に流し込み、排泥鋳込み法によって厚み3mmの成形体を得た。これを乾燥後、ゆっくりと昇温し900℃という比較的低温で焼成することにより、椀状のセラミック部材の素焼き品を得た。これに、硝酸コバルト6水和物（$Co(NO_3)_2 \cdot 6H_2O$）20gを、純水に溶解し、全体を100mlにした淡ピンク色を呈する透明な着色剤溶液と、硝酸クロム9水和物（$Cr(NO_3)_2 \cdot 9H_2O$）30gを純水に溶解し、全体を100mlにした濃紫色を呈する透明な着色剤溶液を用いて実施例1及び実施例2と同様の技法で模様を描写した。自然乾燥を一昼夜行い、電気炉を用いて1100℃で仮焼し、透光感を得るために真空炉で1700℃で焼結させてから好ましい色調を得るために再度ガス炉で1600℃で酸化焼成して透光感のあるアイボリーの素地に青と赤の模様が浮かび上がった透光性セラミック部材を得た。これをダイヤモンド砥粒を用いる手研磨によって表面を研磨して光沢の美しさと手触りのよさを整えた。次に、透光性セラミック部材の模様の周囲に陶芸用の緑色の上絵具を用いて輪郭を描き、乾燥後、電気炉を用いて800℃で焼成し、融着させて着色層による輪郭を形成した。これにより部材の着色した部分の周囲に、色調の異なる境界部に鮮やかな緑

色で縁取りされた中に青と赤の模様が鮮明に浮かび上がった透光性セラミックによるランプシェードを得た。

【0032】－実施例4－

実施例3と同様に、セラミック部材1を透光性のアルミナセラミックで構成する場合、実施例3と同様に、アルミナスラリーを得て、これを排泥鋳込み法によって厚み1．5mmの成形体を得た。これを乾燥後、900℃で焼成して、小さな椀状のセラミック部材の素焼き品を得た。これに硝酸マンガン6水和物（$Mn(NO_3)_2 \cdot 6H_2O$）20gを純水に溶解し、全体を100mlにした淡いピンク色を呈する透明な着色剤溶液を用いて実施例1、2、3と同様の技法で模様を描写し、自然乾燥を一昼夜行い、電気炉を用いて1100℃で仮焼し、真空炉で1700℃で焼結させてから再度ガス炉で1600℃で酸化焼成して透光感のあるアイボリーの地に柿色の模様がほのかに浮かび上がった透光性セラミックで形成された酒杯を得た。これをバレル研磨によって表面を平滑な光沢面に仕上げて手触りのよさを整えた。次に、この酒杯の模様の周囲に陶芸用の金液を用いて輪郭を描き、乾燥後、電気炉を用いて800℃で焼成して固着させて、金色の着色層による輪郭を形成した。これにより部材の着色した部分の周囲に色の滲みがなく、アイボリーの地に柿色の模様がくっきりと美しく浮かび上がった透光性セラミックで形成された冷酒用酒杯を得た。

【0033】

【発明の効果】以上のように、本発明に係るセラミック部材では、他の部位とは異なる色彩を呈する彩色部の輪郭部に、この彩色部とは異なる色彩を呈する着色部を設けたことから、彩色部の輪郭部におけるにじみや、彩色部と彩色部の境界部における混色をこの着色部で隠蔽することができ、もってセラミック部材の表面に模様などを力強くメリハリを付けて描写することができると共に、陶芸品、工芸品あるいは装飾品としての価値を一層高めることができる。

【0034】また、本発明に係るセラミック部材の製造方法では、セラミック部材の生成形体もしくは素焼き品に着色剤溶液を塗布して焼成することにより他の部分とは異なる色彩を呈する彩色部を形成し、しかる後、この彩色部の輪郭部に、この彩色部とは異なる色彩を呈する着色部を形成することから、彩色部の輪郭部ににじみや混色を発生することなく他の部分と明瞭に区画された着色部を容易に形成することができる。

【図面の簡単な説明】

【図1】本発明に係るセラミック部材の一実施例を示す図である。

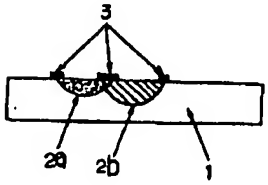
【図2】本発明に係るセラミック部材の製造方法の一工程を示す図である。

【図3】本発明に係るセラミック部材の製造方法の他の工程を示す図である。

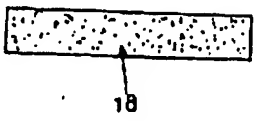
【符号の説明】

1・・・セラミック部材、1a・・・セラミック部材の生成形体、2a、2b・・・彩色部、3・・・着色部

【図1】



【図2】



【図3】